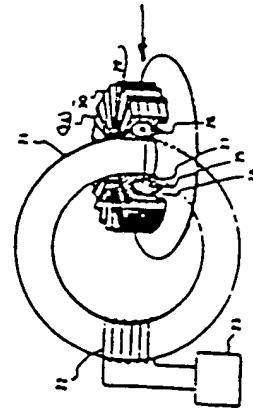


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(54) GENERATING METHOD OF HIGH PRESSURE PLASMA ARC
(11) 2-250399 (A) (43) 23.10.1990 (19) JP
(21) Appl. No. 64-78383 (22) 31.3.1989
(71) FUJI DENPA KOKI K.K. (72) RYUICHI SHIMADA
(51) Int Cl. H05H1/46

PURPOSE: To generate high pressure plasma arc electrodelessly by generating plasma by means of applying high frequency voltage in a condition the gas pressure in furnace is sufficiently lowered, and then by retaining the plasma current and gradually increasing the pressure in furnace at the same time.

CONSTITUTION: In a condition the gas pressure in a hollow part 25 is sufficiently lowered so as to electrodeless discharge is easily performed, an induction field is generated from a high frequency oscillator 23 through a transformer core 21, according to the principle of transformer, and high frequency voltage is applied to a discharge tube 24 so as to generate a toroidal plasma. Then, as applying high frequency voltage, by retaining the plasma current and gradually increasing the gas pressure in the hollow part 25 at the same time, high pressure plasma arc is generated. Air current is rotated so as to offset plasma buoyancy of the hollow part 25 stably for a long time.



22 primary coil, 24 glass tube, 26 inlet hole, 21 cylinder body, 23 potential magnetic field coil, 20 secondary magnetic field coil

① 日本国特許庁 (JP)

② 特許出願公開

③ 公開特許公報 (A) 平2-260399

④ Int.Cl.

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⑥ 発明の名称 高気圧プラズマアーク発生方法

⑦ 登録 平1-78383

⑧ 出願 平1(1989)3月31日

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明　　題　　名

1. 発明の名稱

高気圧プラズマアーク発生方法

2. 発明の範囲

(1) 高気圧プラズマの最高点火を用いて、
高壓、高周波の分離電極を分離する高壓プラズマア
ークがにおいて、炉内のガス圧力を十分上げた状
態で高圧電圧を印加しプラズマを発生させた後、
そのプラズマ電流を測定したとき炉内電圧を測定
に上昇させることによって、高気圧のプラズマア
ークを発生することを特徴とする高気圧プラズマ
アーク発生方法。

(2) 高壓プラズマアーケットとして、高氣圧
アーケットをトーラス形炉にて高電圧電離させること
により、電極からの放電光と電極の燃焼をなくし
た高壓プラズマアーケットを用いることを特徴とす
る高電圧ヒータの高気圧プラズマアーケット発生方法。

3. 発明の目的な説明

(従来上の利用分野)

本発明は高気圧プラズマの最高点火を用いて、

高壓、高周波の分離電極の分離を行う高壓プラズマ
アーケットを用いた高気圧プラズマアーケット発生方法
の改良に関するものである。

【従来の技術】

高アラズマの応用は、その元、高を用いて高
周波、高周波アーケット、アーケット回路等があり、その
高周波を生かし、高壓をうまく利用することが重
要である。

しかし、アラズマではどのような高周波電圧も高周波
に元のレベルに適用する、という能力があり、当
アラズマの応用一つとして高周波を切分され
られる。例えばPCの分離とかフロンの分
離がそれである。

一方多くの高次回路が開発されているが電力多
く高電圧アラズマとなるのが最大の問題点とされて
きた。しかし、特に高電圧高周波な領域(5000
V以上)では、いかで何時に高電圧を発生するとい
う問題がある。その性質を最大限活用して、自
身が周波数を切ることができる。アラズマの電
流を自己のアーケットより抜くして、2万V以上にし、

昭和26年3月26日(3)

うに、高電圧で放電しやすいように中空部25内のガス圧力を十分下りた後で、高圧放電管23からトランスクォア21を介して放電管の端面で放電火花を発生させ、放電管24に高圧放電管25とレトロイダムプラズマを発生させる。その後、高圧放電管を回転しながら、そのプラズマ電流を回路したまま中空部25内のガス圧力(気圧)を同時に上昇させることによって、高電圧のプラズマアーカーを発生する。このとき、放電を発生させ、高電圧になると生じるプラズマの斥力を打ち消し、プラズマモード空部25の中心部に高圧放電管24に発生させる。従って、高電圧のプラズマアーカーをトーラス形状にて放電火花を発生させることができ、光源からの距離れと電極の距離をなくすことができる。

尚、アーカーを高圧にするには電離密度を高める必要がある。そのためには充電管を絞り、気圧を高める必要がある。また電子密度とイオン密度の比を小さくして気体の組成を高めるにも高圧を高くするのがよい。

放電装置である。

21—トランスクォア、22—1次巻線、
23—高圧放電管、24—放電管、25—中空
部、26—ガラスリミッタ、27—吸入口、
28—排氣孔穴。

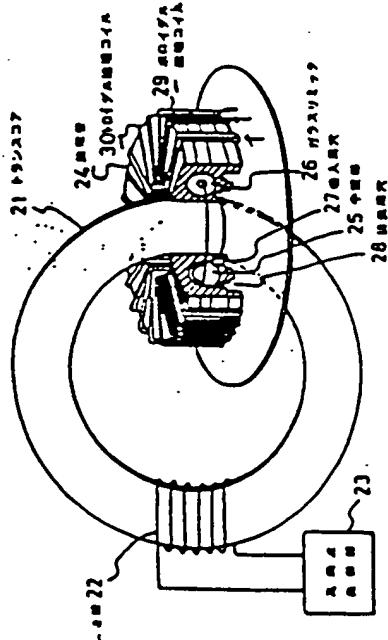
又、高電圧放電のプラズマアーカーを発生するためににはモフレーキングを用いるに十分な高電圧を放電管に必要とするが、実験ではトーラス状のプラズマを高電圧ガス中で得る方法はなかった。そこで、本発明によるプラズマアーカーは炉内の気圧が高めであるトーラス炉内と、放電管の周囲で放電火花を発生させるトランスクォア部の周囲は放電管からなる。

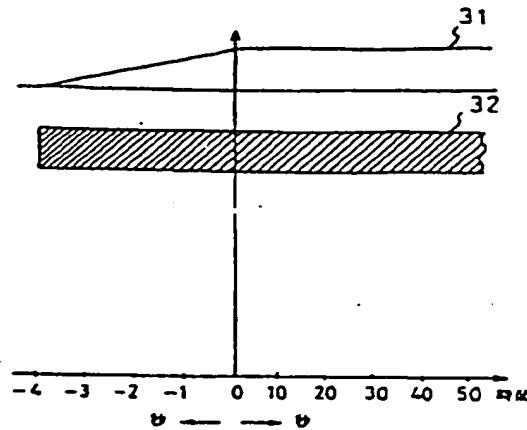
【発明の範囲】

以上述べたように本発明によれば、高圧プラズマアーカーにおいて高圧プラズマを高電圧にて、放電などの現象を呈なしに放電管を可変な電極をプラズマ内で構成され、日本のように高电压が規制である。

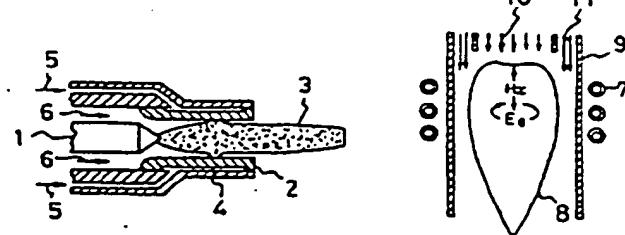
4. 装置の簡単な説明

第1図は本発明の一実施例を示す断面図、第2図は本発明に係るガス圧力検出及び高圧放電管の出力検出の一例を示す断面図、第3図は本発明の実施例のDCプラズマトーチの電離構造を示す断面図、第4図は高圧放電管アーカー発生装置を示す断面図。





第2図



第3図

第4図

(19) Japan Patent Office (JP)

(12) Public Official Report of Patent (A)

(11) Public Number of Patent Application

2-260399

(43) Date of opening to public

1990/10/23

(51) Int Cl. 5 H05H 1/46 Identification symbol

Reference number in Patent Office 7458-2G

Part of Technical indication

Request of Examination Unrequest Number of requests 2 (all 4 pages)

(54) Name of the invention

Method of generating high-pressure plasma arc

(21) Application Number: 1-78383

(22) Date of Application: 1989/3/31

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6-2-22 Fujimi, Tsurugashima-shi, Saitama Pref.

(74) Agent Lawyer TAKEHIKO SUZUE and three more

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CONSTITUTION: In a condition the gas pressure in a hollow part 25 is sufficiently lowered so as to electrodeless discharge is easily performed, an induction field is generated from a high frequency oscillator 23 through a transformer core 21, according to the principle of transformer, and high frequency voltage is applied to a discharge tube 24 so as to generate a toroidal plasma. Then, as applying high-frequency voltage, by retaining the plasma current and gradually increasing the gas pressure in the hollow part

25 at the same time, high pressure plasma arc is generated. Air current is rotated so as to offset plasma buoyancy generated at high pressure, and the plasma is thus generated near the center of the hollow part 25 stably for a long time.

Detailed statement

1. Name of invention

Method of generating high-pressure plasma arc

2. Limits of patent requests

- (1) M
- (2) The method of generating high pressure plasma arc in a high temperature plasma arc furnace to decompose organic and inorganic harmful materials using heating and light emission from the high pressure plasma by the followed procedure: First, the plasma is generated by applying high-frequency voltage in low gas pressure. After that, the high pressure plasma arc is generated by gradually increasing the gas pressure with sustaining the plasma power.
- (2) The method of generating the high pressure plasma arc shown above (request (1)) in a high temperature plasma arc furnace, where electrodeless plasma is generated with the "torrus" shape of high pressure arc so that heat loss from the electrodes or the consumption of the electrodes is eliminated.

3. Detailed explanation of invention

Field of use in industry: This invention is related to the improvement of the method of high pressure plasma arc generation in a high temperature plasma arc furnace, where organic and inorganic harmful materials are decomposed by utilizing the heat and the light emission from the high pressure plasma.

Conventional technique: There are applications of heat plasmas such as light source, arc furnace for steel manufacture, arc welding, etc. utilizing the light and the heat from the plasma, where it is important to well utilize the plasma controllability and high temperature.

Plasma has an ability to finally destroy any poisonous wastes to elements level. Therefore, the decomposition of industrial wastes is considered one of the applications

of plasma furnaces. For example, the decomposition of PCB and Fluorocarbon, etc. Although many research results have been reported, the largest problem has been that this process consumed a lot of electric power. However, the plasma has a feature to generate high temperature, which is difficult to be obtained with the other methods, especially in high temperature ($> 5000 ^\circ\text{C}$) and high density region. Utilizing this feature, it is possible to make a special ultra-high temperature furnace.

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Page 609.

After that, high pressure plasma arc is generated by gradually increasing the gas pressure in the hollow part 25 with sustaining the plasma current by applying high-frequency voltage. At this moment, the plasma buoyancy, which is generated at high pressure, is canceled by rotating the gas flow, and the plasma is generated at the center of the hollow part 25 stably for a long time. Therefore, it is possible to generate a high pressure plasma in a "torus" shape without electrodes and eliminate the heat loss from the electrodes and consumption of the electrodes.

It is necessary to increase the current density in order to make the high temperature arc. Therefore, it is necessary to decrease the radius of current path and increase the pressure. High pressure is also useful to increase the gas temperature by reducing the difference between the electron temperature and the ion temperature.

Conventionally, it was impossible to generate an electrodeless, "torus" shaped plasma in high pressure gas, because high voltage is required between the two electrodes enough to break down the high pressure gas and obtain high pressure plasma arc. Therefore, the plasma arc furnace related to this invention consists of a "torus" shaped chamber having pressure controllability, a transformer core to generate inductive field according to the principle of a transformer and a high-frequency oscillator.

Effectiveness of the invention

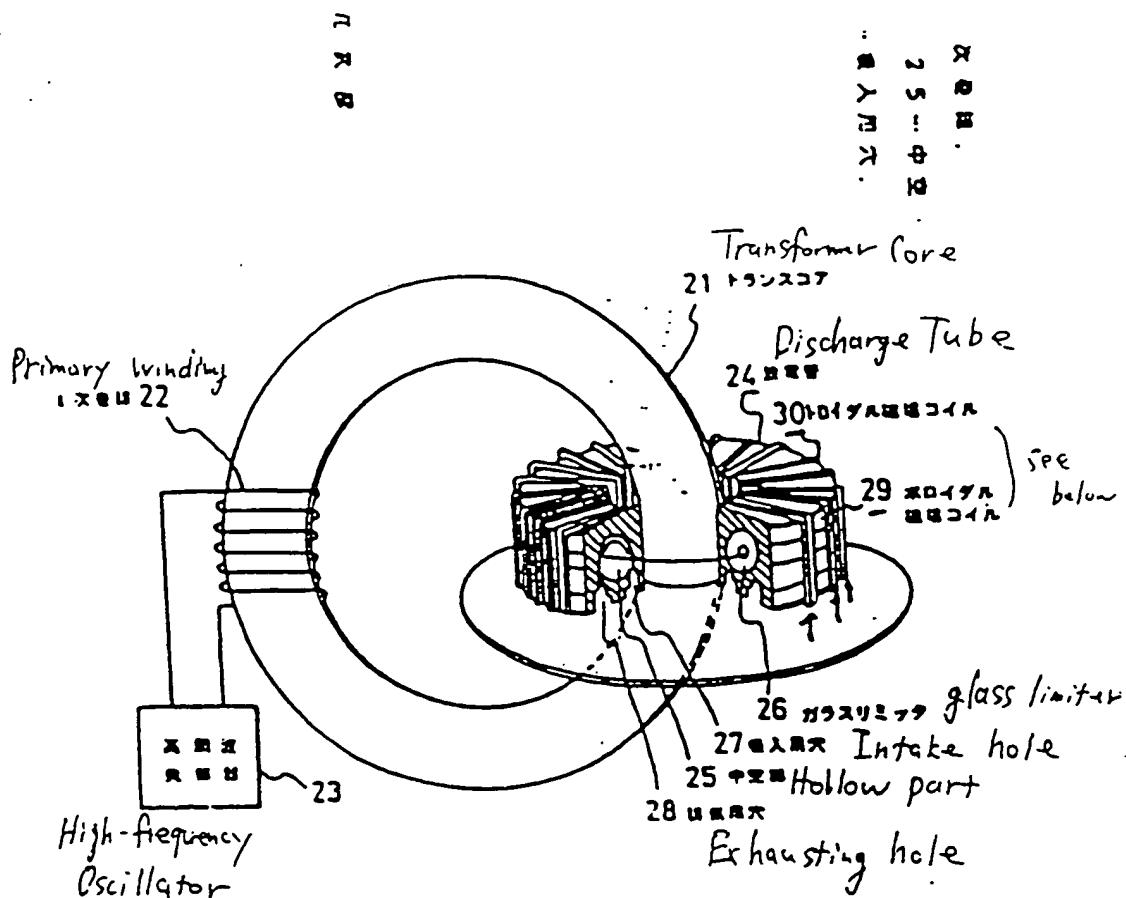
As mentioned above, this invention gives an electrodeless plasma which can be operated continuously without consumption parts such as electrodes in a high

temperature plasma arc furnace, and an efficient high temperature furnace can be provided.

Simple explanations of the drawings

Figure 1 shows the structural view of an example of implementation using this invention. Figure 2 shows the characteristics of the gas pressure and the output of the high-frequency oscillator related to this invention. Figure 3 shows the cross section of the electrode structure of a typical DC plasma torch conventionally used. Figure 4 shows the structural cross section of the principle of high-frequency plasma generation. 21: transformer core, 22: primary winding, 23: high-frequency oscillator, 24: discharge tube, 25: hollow part, 26: glass limiter, 27: intake hole, 28: exhausting hole.

機器の構成
は、電圧を
高め、電流を
減らすための
トランジスタの
入力端子と出力
端子。図4は電
磁場コイルの生
産を示す。

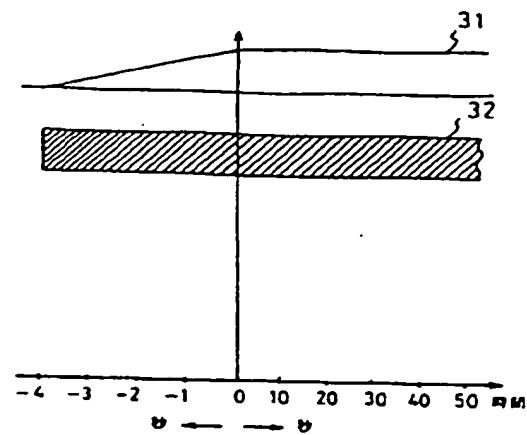


第1図
Figure 1

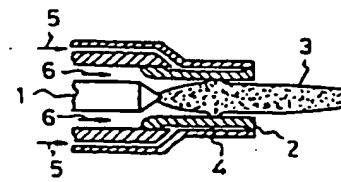
30 Toroidal Magnetic Field Coil

3

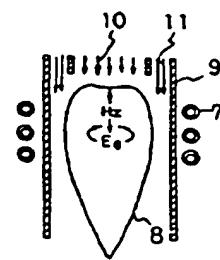
29 Borroidal Magnetic Field Coil
or
Parroidal



第2図



第3図



第4図